Cable Agreement Compliance

Audit Two of Three

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1. Executive Summary

This audit evaluates TCI of Washington, Inc.'s (TCI) compliance with the original franchise agreement between the City of Seattle (the City) and TCI and the franchise extension ordinance no. 119183. A technical evaluation and a service availability evaluation were conducted for the Green Lake service area between September 7 and October 12, 1999.

The audit verifies that customers in Green Lake currently have access to both expanded programming and cable modem services as defined in the extension ordinance. Expanded programming for video and @Home services was confirmed through both an engineering audit of the fiber optic nodes and by customer interviews.

The auditors have also reviewed internal node activation reports produced by TCI to confirm the number of customers activated each month through September 30, 1999. These reports were reviewed to determine whether or not TCI has met the requirements of activating an average of 7,000 customers per month. Our evaluation indicates that TCI is in compliance and ahead of schedule with their construction and activation plans. The engineering evaluation shows that TCI's upgraded system does provide a minimum of 70 analog channels within the 54 to 750 MHz spectrum. Transmission tests, conducted by timing large file downloads, show that @Home is faster than traditional dial-up service and faster than Digital Subscriber Line (DSL) service. TCI's network is fully redundant.

Although TCI's network is fully redundant, outages have increased since the last evaluation period, indicating diminished network quality and reliability. Importantly, TCI could not provide a measurement of contention as indicated in the franchise agreement. They contend that customers always have access to the service as long as the network is up.

A service activation evaluation conducted by interviewing TCI customers clearly shows that customers have access to expanded services. However, the interviews show mixed results in terms of the quality of those services and customer satisfaction. While the results are mostly satisfactory, a significant portion of customers is not satisfied with the current level of service. Video quality and customer service problems were the biggest issues for cable TV subscribers. Access and customer service problems were the biggest issues for @Home subscribers.

2. Introduction

This is the second of three audits performed to determine TCI's compliance with the requirements of their cable television franchise agreement and franchise extension ordinance no. 119183. This audit evaluates the upgrade of TCI's network to accommodate 70 channels within the 54 to 750 MHz spectrum and to offer high-speed Internet access throughout areas currently upgraded, as specified in both the original 1996 franchise agreement, and the franchise extension ordinance that took effect this year. The audit evaluates traditional video services as well as @Home services for the Green Lake build area. Audit Two also includes @Home transmission testing for West Seattle.

This audit consists of both a technical evaluation of the TCI network and a service evaluation of TCI customers. The technical evaluation includes certification review, node testing and network reliability and performance, while the service evaluation involves interviewing TCI customers to determine access to service and customer satisfaction. The technical evaluation is detailed in Sections 3 and 4. The service availability evaluation is detailed in Section 5.

Technical Evaluation

The auditors reviewed the certifications received by the City of Seattle from TCI confirming node activation from January 1999 through September 1999.

Technical evaluations of the nodes were performed on September 30, 1999 and October 8 and 12, 1999. Nodes were randomly chosen to represent the general population of each area. Two nodes were tested in the West Seattle and Alki build areas for @Home transmission rates of 1.5 Mbits/sec and 96 Kbits/sec for downstream and upstream, respectively. Six nodes in the Green Lake build area were tested for channel capacity and @Home transmission rates.

The auditors also completed the performance evaluation begun during Audit One to determine the network configuration and to evaluate network redundancies, fiber protection and power supply compliance.

Both the certification review and the reliability and performance evaluation were based on data obtained from TCI's maintenance records.

Service Availability Evaluation

The service availability portion of this audit assesses whether or not TCI offers additional cable television channels and high-speed Internet service to customers in the Green Lake build area. It also assesses customer satisfaction for each service. The service availability study was completed over the course of three weeks with thirty-six TCI cable TV and @Home customer telephone interviews[1]. Twenty-six interviews were completed for cable TV and twenty-four were completed for @Home. Customers subscribe to expanded basic cable service and/or the @Home Internet Service.

The purpose of the survey was to determine whether customers subscribing to TCI's expanded basic package have access to 70 programming channels and whether customers have access to the Internet through the @Home service. It also rates the quality of programming and functionality of the cable TV service and the speed and functionality of the @Home service. In addition to determining access to service and quality of service, the survey results indicate the level of customer service satisfaction in terms of professionalism and knowledge of TCI and @Home's customer service staff.

[1] Although the survey results reflect trends in service availability and customer satisfaction, the results taken from a small sample size of 36 are qualitative and therefore not statistically significant.

3. Certification

3. 1 Network Status

This audit confirms TCI's network infrastructure. The certification section provides a complete description of the network and includes additional information acquired since the first audit.

3.1.1 Infrastructure

Cable uses a sophisticated network of technologies that effectively combines point-to-point microwave, satellites, and fiber optic and coaxial cables. In order to provide an understanding of the network architecture and functionality as well as descriptions of various individual elements that are deployed in TCI's network, an overview of the functional configuration of the TCI network is given in Figure 1. This figure has been updated since Audit One to reflect a more accurate depiction of the Seattle network.

There are two headends within the Seattle network that serve the City of Seattle and the greater Seattle area. The main headend in Burien is linked to the Roosevelt headend by the primary fiber ring. The primary ring consists of two self-healing fiber rings. Aerial and underground fiber cables are installed between the hub and the nodes. From the nodes, coaxial cables are connected to the customer premises. The cables are in satisfactory condition as evaluated one year after installation.

The Burien headend serves West Seattle with forty-seven local nodes and the secondary hubs within King County. As the main headend, it connects the following:

- 153 Satellite channels
- 13 Off-Air channels
- 9 Local Access channels
- IP routing to California

The second headend at Roosevelt connects eight hubs within the City of Seattle network with approximately 203 nodes each serving an average 1,200 homes.

3.1.1.1 Headend

The Burien headend houses the electronics equipment for the cable television system and @Home Internet services. Signals from broadcast transmissions, satellites and local television studios are received and processed at the system headend.

The Burien headend receives TV and IP signals via various transmission media (satellite, off-air and local access fiber) and coverts them to optical signals, which can be sent over fiber. To deliver digital data, the headend controller modulates the IP packets, encodes them as a digital signal and transmits the signal down the cable on an unused channel above the TV channels. TCI's Internet services feed in using IP routing from California.

3.1.1.2 Hybrid Fiber & Coax (HFC)

TCI deploys HFC grid to deliver both cable television (CATV) and Internet services, and has installed considerable new aerial fiber optic cables on poles throughout Seattle. Fiber optic cables are the main trunk cables, with coaxial cable reaching into homes from the nodes.

3.1.1.3 Node

To send television signals and data over an HFC network, laser transmitters convert signals sent from the headend into optical signals. This conversion occurs in node boxes which are usually attached to poles and are environmentally protected. At various points within the network, close by the residences or businesses, laser receivers at each node reconvert the optical signals into electrical signals.

3.1.1.4 Customer Premises

At a customer's premises, a cable splitter is installed. The cable splitter enables connection to both the computer's cable modem and the TV set.

3.1.2 Build Areas: Green Lake

Table 1 summarizes the number of customers that have been activated for the nodes. Tables 2 through 4 show the statistics of each node including the number of new customers reached by each node for the West Seattle/Alki and Green Lake build areas.

Table 1: Customers Activated

Build Area	No. of Nodes	No. of homes passed	No. of customers	Construction complete date	Activation date
Alki	11	10,822	6,812	10/31/98-12/18/98	11/11/98-3/9/99
West Seattle	47	23,981	15,595	10/1/96	7/7/98-8/11/98
Green Lake	46	40,188	22,762	2/21/99-5/21/99	3/16/99-6/3/99
Total	**104**	**74,991**	**45,169**		

Table 2: West Seattle

Node	No. of homes passed	No. of Customers	Construction complete date	Activation date	Comments
WS01	311	235	10/1/96	8/4/98	
WS02	603	452	10/1/96	7/14/98	Tested
WS03	424	267	10/1/96	8/4/98	
WS04	320	243	10/1/96	8/4/98	
WS05	583	378	10/1/96	8/4/98	
WS06	498	402	10/1/96	8/4/98	
WS07	601	496	10/1/96	8/4/98	
WS08	545	381	10/1/96	8/4/98	
WS09	561	346	10/1/96	8/4/98	
WS10	478	318	10/1/96	8/4/98	
WS11	481	330	10/1/96	8/4/98	
WS12	557	322	10/1/96	7/28/98	
WS13	533	341	10/1/96	7/28/98	Tested
WS14	557	387	10/1/96	7/28/98	
WS15	703	432	10/1/96	7/28/98	
WS16	504	359	10/1/96	7/28/98	
WS17	270	207	10/1/96	7/21/98	
WS18	544	416	10/1/96	7/21/98	
WS19	394	284	10/1/96	7/28/98	
WS20	532	310	10/1/96	7/21/98	
WS21	616	419	10/1/96	7/21/98	Tested
WS22	578	397	10/1/96	8/4/98	
WS23	616	296	10/1/96	7/14/98	
WS24	548	313	10/1/96	7/14/98	
WS25	654	348	10/1/96	8/11/98	
WS26	599	407	10/1/96	8/11/98	
WS27	748	565	10/1/96	8/11/98	
WS28	496	314	10/1/96	8/11/98	
WS29	590	320	10/1/96	8/11/98	Tested
WS30	449	288	10/1/96	8/11/98	
WS31	446	280	10/1/96	8/11/98	
WS32	543	302	10/1/96	8/11/98	
WS33	576	216	10/1/96	7/21/98	
WS34	517	653	10/1/96	8/11/98	
WS35	454	274	10/1/96	8/11/98	
WS36	573	372	10/1/96	7/14/98	
					Missing
WS38	489	292	10/1/96	7/14/98	
					Missing
WS40	571	326	10/1/96	8/11/98	
WS41	457	299	10/1/96	8/11/98	
WS42	316	203	10/1/96	7/14/98	
WS43	470	254	10/1/96	7/21/98	
WS44	476	248	10/1/96	7/14/98	
WS45	500	303	10/1/96	7/14/98	
WS46	229	136	10/1/96	7/21/98	
WS47	399	210	10/1/96	7/14/98	
WS48	484	247	10/1/96	7/7/98	Tested

WS49	588	407	10/1/96	7/7/98	
Total	**23,981**	**15,595**			

Table 3: Alki

Node	No. of homes passed	No. of Customers	Construction complete date	Activation date	Comments
WS56	140	86	10/31/98	11/11/98	
WS57	711	447	10/31/98	11/18/98	
WS58	1277	799	11/10/98	11/19/98	
WS59	632	443	12/18/98	3/9/99	
WS60	1331	745	11/10/98	11/18/98	
WS61	757	498	11/10/98	11/11/98	Tested
WS62	1249	727	11/10/98	11/19/98	
WS63	1258	768	11/10/98	11/18/98	Tested
WS64	941	621	11/10/98	11/19/98	
WS65	1246	832	11/5/98	11/11/98	
WS66	1280	846	11/5/98	11/11/98	
Total	**10,822**	**6,812**			

Table 4: Green Lake

Node	No. of homes passed	No. of Customers	Construction complete date	Activation date	Comments
GL16	1193	714	2/28/99	3/16/99	Tested
GL17	1179	730	2/28/99	3/16/99	
GL18	1252	807	2/28/99	3/16/99	Tested
GL19	1166	740	2/28/99	3/16/99	
GL20	1036	722	2/28/99	3/16/99	Tested
GL21	1319	712	2/28/99	3/16/99	
GL22	1015	590	2/28/99	3/16/99	
GL23	1165	612	2/28/99	3/16/99	
GL24	939	503	1/29/99	3/16/99	
GL25	1102	661	2/28/99	3/16/99	
GL26	1127	591	2/28/99	3/16/99	Tested
GL27	763	417	2/28/99	3/16/99	Tested
GL28	1077	565	1/29/99	3/16/99	
GL29	1175	579	1/29/99	3/16/99	
GL30	783	398	1/29/99	3/16/99	Tested
GL31	420	332	4/21/99	4/27/99	Tested
GL32	993	582	4/21/99	4/27/99	
GL33	773	440	4/21/99	4/27/99	
GL34	835	626	4/21/99	4/27/99	
GL35	1124	564	4/15/99	4/15/99	
GL36	1026	536	3/31/99	4/15/99	
GL37	853	403	9/31/99	4/15/99	
GL38	1140	518	3/31/99	4/15/99	
GL 39	1150	570	3/31/99	4/15/99	Tested
GL40	1155	561	3/31/99	4/15/99	
GL 41	1127	480	3/31/99	4/15/99	Tested
GL42	1127	617	4/2/99	4/15/99	

GL43	603	343	4/2/99	4/15/99	
GL44	819	389	4/20/99	4/22/99	
GL45	1107	502	3/31/99	4/15/99	
GL46	421	187	4/20/99	4/22/99	Tested
GL47	497	218	4/20/99	4/22/99	
GL48	858	432	4/20/99	4/22/99	
GL49	768	396	4/20/99	4/22/99	
UW15	434	322	5/14/99	5/18/99	
UW16	537	382	5/14/99	6/3/99	
UW17	340	211	5/14/99	6/3/99	
UW18	674	400	5/21/99	6/3/99	Tested
UW19	847	543	5/21/99	6/3/99	
UW20	604	464	5/14/99	5/18/99	
UW21	599	325	5/21/99	6/3/99	
UW22	584	414	5/21/99	6/3/99	
UW23	790	595	5/14/99	5/18/99	
UW24	573	397	5/21/99	6/3/99	
UW25	436	272	5/21/99	6/3/99	
UW26	583	400	5/21/99	6/3/99	
Total	**40,188**	**22,762**			

3.2 Compliance Verification of TCI Reports

A total of 104 nodes are evaluated in this report, as shown in Table 1 above. Table 4 shows the number of customers activated per node and when full service was made available by each node in the West Seattle and Green Lake build areas. The nodes highlighted in red were inspected and tested.

3.2.1 Network Reliability and Performance

Audit One determined a high quality network in terms of reliability and performance. The criteria used to determine reliability and performance for both Audit I and Audit II were redundancy, power supply, mean time between failures (MTBF) and mean time to repair (MTTR). After reviewing TCI's maintenance records for July, August and September 1999, the engineering auditor confirms a drop in the reliability and network quality in terms of MTBF and MTTR.

3.2.1.1 Redundancies

As depicted in the TCI network architecture, redundancies are built in the system especially at the headend, which is central to the network. The expectation is that any major fault occurring at either of the headends will be restored as soon as possible (usually within seconds) and that outages will be transparent to the customers. Two headends are available and are connected to a self-healing fiber ring, providing redundancy for each other. In addition, eight hubs within the City of Seattle share three secondary fiber rings, providing further redundancy for the network. All the equipment has main and hot standby power.

3.2.1.2 Power Supply

The system at the headend operates on –48 V DC. There is an uninterrupted power supply (UPS) system with battery backup and a standby generator for the headends. The @Home nodes have a separate UPS system.

3.2.1.3. MTBF/MTTR

Mean time between failures (MTBF) and mean time to repair (MTTR) are standard measurements that indicate the quality of the network. The overall availability of the system from January 1999 to September 1999 is 99.8574 percent, equivalent to a system downtime of 1121 minutes (18.6833 hours). This measurement indicates that from January to September 1999, the total network outage was 18.68

hours. This availability rate indicates an unreliable network. A reliable network would have greater than 99.9999 percent availability or approximately fifty-two minutes of downtime in one year.

MTTR at 1.82 hours is acceptable at present; however, it is also increasing proportional to network size.

These figures indicate that as TCI activates more service areas, system reliability and network quality diminish. See Appendix I for copies of TCI's maintenance report.

4. Node Testing

Node testing was completed to verify 70 channels node capacity within the 54 to 750 MHz frequency spectrum and 1.5 Mbps downstream and 96 kbps upstream transmission rates.

4.1 Procedure

Nodes tested were randomly selected from testing areas as depicted in Tables 2 through 4 above.

750 MHz capacity verification tests were conducted in the evening between 6 p.m. and 8 p.m. on September 30, 1999. Tests were conducted using a scan graph method, which provides the graph for the full 750 MHz spectrum depicting all the 70 channels.

Transmission rate tests were conducted during the afternoon and early evening on October 8and 12, 1999 in order to capture possible variations in the transmission rates due to system usage or peak and off-peak network loading periods.

The transmission rate of 1.5 Mbps specified in the franchise agreement is equivalent to a full T1 rate. TCI network does not provide a dedicated T1 or 1.5 Mbps facilities for every home. Their network is structured to provide equal access for all their customers to all their facilities. Since TCI lacks the appropriate test instruments to test Bit Error Rate (BER) performance of digital cable, it is difficult to verify the actual downstream and upstream transmission rates. As an alternative to this test, we used timed file downloads to test the average transmission speed. We believe the file download speed test more accurately reflects a customer's experience with the @Home service.

To complete the file download, a TCI technician chose a file from the @Home site. The auditor recorded the file size in megabytes, and then recorded the total download time with a stopwatch. Since the transmission rate (transfer rate) is in megabits per seconds, the file size in megabytes per second was multiplied by eight to give a transfer rate in megabits/second, i.e. (53.4 megabytes X 8 bits) / 350 seconds = 1.22 megabits/second.

The tests were conducted by a TCI employee and verified at the site by the auditor. At least two TCI employees accompanied the auditor during the node tests.

4.2 Nodes Tested

For the West Seattle build area, three nodes (WS29, WS44, WS63) were selected and tested for @Home transmission speeds. In the Green Lake build area (ZIP Codes 98103, 98133, 98117, and 98107), six nodes (GL20, GL31, GL39, GL41, GL46, UW18) were selected and tested for both @Home transmission speed and 750 MHz capacity.

4.3 Node Capacity Test Results

CATV RF Spectrum is given in Figure 2 to show the frequency range of the spectrum and channel allocation. Figure 2 is an exact replica of the test results of the spectrum. The test results for the area studied show that each node tested has 70 channels capacity within the 54 to 750 MHz spectrum.

4.4 Compliance

4.4.1 750 MHz Node Capacity

The scan graphs in Appendix 2 show that TCI has met the 750 MHz, 70 channel requirements for the areas tested. From the frequency spectrum graphs, it is apparent that there were no interference or distortion to the signals at the time of the testing. The network performed satisfactorily at the time of testing.

4.4.2 Customer Activations

Table 5 summarizes the number of nodes and number of customers activated through September 1999. TCI has activated a total of 55,312 customers so far this year meeting the franchise extension ordinance requirements of 42,000 customers by the end of September 1999.[2]

Table 5: City of Seattle Customer Activations

Month Ending 1999	Build Areas	No. of Nodes	No. of homes passed	No of customers activated	Total activations / month
January					
February					
March	BH01.01	2	1502	706	
	GL04	15	16,291	9,341	10,047
April	GL02	9	7,820	4,429	
	GL01	10	9,076	4,267	8,696
May	GL01	1	434	322	
	GL03	2	1,394	1,059	1,381
June	QA03.01	2	2,304	1,517	
	BH01.03	2	649	369	
	GL03	9	5,173	3,344	5,230
July	QA03.02	3	2,962	1,875	
	QA03.01	2	2,304	1,517	
	QA01.02	5	5,537	2,976	
	QA01.03	5	5,182	2,875	9,243
August	QA03.01	1	898	578	
	QA03.02	1	1,248	1,241	
	QA02	1	382	303	
	SS01.01	8	7,000	4,333	6,455
September	QA03.02	2	2,068	1,388	
	MP01.02	25	26,325	12,104	
	QA03.01	1	1,220	768	14,260

[2] As per Seattle Upgrade Schedule: 62,615 Upgraded Totals / 9 months = 9,093 activations / month

Total			**99,769**	**55,312**	**55,312**

The data from TCI, as replicated in the above table, is located in Appendix 3.

4.4.3 Internet Capability

It is expected that digital signals do not show on the node tests as depicted in Figure 2, where digital signals appear as unused channels after the last video channel within the 54 to 750 MHz spectrum.

4.4.4 Transmission Rates

File transfer rates are summarized in Table 6. The calculated transfer rate is an average, since the files are transferred at different rates during the download time. Comparing these to Internet dial-up facilities and xDSL (x Digital Subscriber Lines) services, @Home service is faster in both downstream and upstream. As mentioned earlier, neither TCI nor @Home have the necessary resources to conduct high-speed performance measurements; consequently, the file transfer method adopted was the only option for certification.

From the calculated transfer rates and witnessing the download, we conclude that TCI system has the capability and transmission rates to download large files from the Internet at a shorter period of time. Actual results are included in Appendix 4.

Table 6 Transmission Testing

Node Tested	File Size	Download Time	Calculated Transfer Rate	Date/Time Tested
WS 44[3]	1.4 MB	7 seconds	1.6 megabits/sec	Sat. 8/28, 10:30 am
WS 44	47.1 MB	192 seconds	1.96 megabits/sec	Sat. 8/28, 10:30 am
GL 39	53.4 MB	350 seconds	1.22 megabits/sec	Fri. 10/8, 5:00 pm
GL 46	53.4 MB	360 seconds	1.19 megabits/sec	Fri. 10/8, 5:30 pm
GL 20	23.2 MB	150 seconds	1.24 megabits/sec	Tues. 10/12, 2:30 pm
GL 31	23.2 MB	159 seconds	1.17 megabits/sec	Tues, 10/12, 6:45 pm
GL 41	23.2 MB	146 seconds	1.27 megabits/sec	Tues, 10/12, 3:45 pm
UW 18[4]	32.8 MB	200 seconds	1.31 megabits/sec	Tues, 10/12, 4:40 pm
WS 63	23.2 MB	76 seconds	2.44 megabits/sec	Tues, 10/12, 5:00 pm
WS 29	23.2 MB	71 seconds	2.61 megabits/sec	Tues, 10/12, 5:30 pm

[3] Node tests for WS 44 were conducted during a test session. The auditors did not collect a print screen of the download, but only noted file sizes and download times.
[4] GL 53

4.4.5 Contention Rate

The 3% contention rate stipulated in the Franchise Agreement could be neither tested nor verified. Contention is defined as "a condition that occurs when several devices [modems] are vying for access to a line and one of them can get it at a time." [5]

TCI claims that contention is irrelevant as their network is available to all customers at any time without blocking (access denial). TCI contends that customers are only denied access to the service during a system outage.

[5] Newton's Telecom Dictionary: The Official Dictionary of Telecommunications, Harry Newton, Flatiron Publishing, 14th Updated and Expanded Edition, Copyright, 1988.

5. Service Availability

This section of the audit evaluates the expanded programming services available to TCI customers. Specifically, the audit evaluates whether or not TCI has upgraded its cable TV service to offer 70 channels of programming and to offer @Home Internet service throughout the Green Lake build area.

5.1 Survey Methodology

To evaluate service availability, the auditors conducted telephone interviews with 36 TCI and @Home customers. A sample interview lot was randomly selected from TCI's customer list of over 1000 customers located in Green Lake. Every fourth customer was called until at least five customers in each zip code were interviewed. Customers interviewed live in ZIP codes 98103, 98107, 98117 and 98133.

Twenty-six interviews were completed with cable TV customers and twenty-four interviews were completed with @Home customers. All interviews were conducted between September 7 and September 28, 1999. A copy of the survey questions is available in Appendix 5.

The survey conducted for this portion of the audit is qualitative and therefore its results are not statistically significant and cannot be projected into the overall population of cable TV and @Home subscribers in Seattle.

5.2 Survey Findings

5.2.1 Cable TV

Most customers interviewed currently received TCI's upgraded expanded basic cable TV service with 70 channels. Three customers interviewed subscribe to the digital service and were not sure how many channels are included under expanded basic service. Only one customer claimed to not be upgraded. Customers interviewed either subscribe to the expanded basic service or the digital cable service. Twenty-six interviews were completed for the cable TV portion of the questionnaire. A quantitative summary of the survey results is available in Appendix 6.

It should be noted that the ranking criteria used in Audit Two is different from the criteria used in Audit One. In Audit Two a "5" is the highest possible score while a "1" was the worst score.

Overall customers were fairly satisfied or highly satisfied with their cable TV service. Almost all customers gave an average to highly satisfactory rating for program content and variety. Customer service scores were not as favorable with close to one-third of customers ranking TCI poorly.

5.2.1.1 Programming Evaluation and Service Quality

Programming

Customers rated TCI's cable TV service program content and variety between average and high. Twelve of twenty-six customers gave program content a rating of 3, while thirteen gave it a higher score of 4 or 5. Scores for variety of programming were similar. Comments for improvement included having more music channels and more international channels.

Most customers gave the on-screen menu functionality an average score. Unsatisfied customers complained that the guide was not convenient because they had to scroll through the digital channel menu before viewing the expanded basic selection. Others said that the guide moves too fast and is difficult to follow.

Customers ranked video and audio quality high, although some customers were less satisfied with the video quality because of poor channel reception on one or several channels. Video problems include

snowy channels or bars through channels. Two customers said that video quality on one or several channels diminished after TCI's network upgrade.

Service Disruption

Almost all of the customers interviewed have experienced service disruption less than ten percent of the time while using TCI expanded basic cable service. Most customers commented that their service was disrupted only once or twice. One customer said service was disrupted between ten and twenty-five percent of the time because four channels never tune in properly.

5.2.1.2 Customer and Repair Service Evaluation

Customer Service

Most customers who answered the cable TV questions, have called TCI cable TV customer at least once. Most customers needed to speak with a live person to answer their question or resolve their problem.

Survey participants ranked TCI's cable TV customer service across the board in terms of both courteous and professional attitude and knowledge. While close to two-thirds of customers ranked gave representatives an average to high score, about one-third of customers ranked customer service poorly in terms of both attitude and knowledge. Customers that were not satisfied with TCI customer service complained that it was difficult to reach representatives or that the representative was not knowledgeable.

Two-thirds of customers were satisfied with the length of time they waited to speak with someone at TCI customer service. These customers only waited between thirty seconds and two minutes to speak with a customer service representative. Six of eighteen Green Lake customers waited more than two minutes for a customer service representative. No customers have ever received a busy signal.

Repair Service

Most customers have placed an on-site installation or repair request with TCI and the work was completed either between three days and one week, or over a week.

Customer Rebates

Most customers interviewed that were eligible for the upgrade reported receiving customer rebates on their cable bill or free movie coupons. One customer claimed he had not received channel upgrades or rebates. Two customers have received upgrades, but no rebates. Neither customer that has not received a rebate has called TCI to inquire about this compensation.

5.2.2 @Home

Twenty-four interviews were completed in the Green Lake build area for the @Home portion of the questionnaire. Since the @Home service was recently rolled out in this area, customers interviewed have had access to the service for a few days or at the most a few months. Some customers interviewed have ordered the service and are waiting for it to be installed.

Results for the @Home service were fairly positive. Most customers were extremely pleased with the speed of access and speed of the service, but some complained about not having immediate and uninterrupted service.

Customers ranked customer service very highly in terms of courteous and professional attitude. Although most customers felt that representatives were knowledgeable, one-fifth of customers were not satisfied with @Home's ability to resolve service issues. Finally, customers wait, often longer than several minutes, to speak with a representative that could solve their problem.

5.2.2.1 Quality of the @Home service

Speed and Access

Most customers indicated that, compared to a regular telephone line, the @Home service is meeting their expectations for speedy Internet access. Twenty of twenty-four customers gave speed either a 4 out of 5 or a 5 out of 5 satisfaction ranking. Only a few customers thought that the @Home service should provide faster access.

Customers did not have the similar successes in accessing the service. Although two-thirds of @Home users were fairly satisfied and agreed to having immediate and uninterrupted access with @Home, eight of the twenty-four customers admitted having difficulties accessing the Internet. One user has had the service for one month and has not had access three quarters of that time. Another customer had to use his dial-up service twice because he could not access @Home. Another user said that he was without access for two days. One customer suggested that TCI use the @Home home page to warn customers of potential service outages.

None of the users that subscribe to both @Home and TCI cable TV have experienced problems accessing the Internet while the TV is on.

Functionality

Most people were satisfied with the @Home e-mail service. However, those customers that had difficulty accessing the Internet gave the e-mail service a lower ranking as it was not available to use. A few customers have not been able to access @Home e-mail at all. Most customers interviewed never tried accessing the @Home e-mail account remotely. In fact, many customers did not know about the option to use remote @Home e-mail. Those that have tried using the service remotely have been successful.

Most customers have not used the @Home search engine enough to comment. Of those that have used the search engine, one-half was satisfied, the other half was not satisfied.

Video and Audio Quality

Overall customers were satisfied with the video and audio quality of @Home compared to a regular telephone line.

Speed as Advertised

Nineteen of twenty-four customers said that the @Home service meets their expectations for speed and that the service seems to be, as advertised, 20 to 100 times faster than a regular phone line. A few customers expressed pure delight with regards to the speed of service. Four of the nineteen indicated that although @Home is faster, the overall speed is closer to 20 times faster. Some customers are concerned that the speed of service will diminish as the number of new subscribers increases. Only five customers were not currently satisfied with the speed of access.

About one-half of customers indicated that Internet service is slower during the early evening between 6:00 p.m. and 10:00 p.m. One person noted that service is slower during early afternoon, another said service is slower after 10 p.m.

5.2.2.2 Quality of Installation, Customer and Repair Service

In general, customers ranked TCI customer service highly for installation, customer and repair service; however, customers felt that they waited too long to speak with a customer service representative and not all customer service representatives scored highly in terms of knowledge.

Installation

Almost all customers interviewed were pleased with the overall installation experience. Comments ranged between pleasant and exceptional. Customers gave technicians high scores for knowledge and for professional and friendly attitude. The few customers that did not characterize the installation experience favorably had varying reasons. A Macintosh computer user said the TCI is not as proficient with the Macintosh operating system and therefore spent extra time installing the service. Another customer that was not present during the installation said that the installer did not leave the registration information.

Most of the installations were completed on time as scheduled. A few customers were displeased that the installer showed up at the end of the scheduled window of time and then took several hours to complete the install. One customer's installer did not show up for the originally scheduled installation. A few customers required repeat visits in order to install the service.

Customer Service and Repair Service

Most customers (twenty-two of twenty four) have called @Home or TCI customer service with a question or to report a problem. Customers were fairly sure about whom to call for service. A few customers called TCI instead of @Home, but most called @Home right away. One customer received a busy signal when calling @Home customer services.

Almost all customer problems required speaking with a customer service representative to reach resolution. Although wait times to speak to a customer service representative were reasonable, several customers had to wait on the line twice to speak to a second, more knowledgeable technician or engineer. About one-half of customers spoke with the first attendant in less than two minutes, whereas the other half had to wait more than two minutes. Some people waited between ten and twenty minutes on hold. Three of the customers that got to the first person quickly had to wait several more minutes to speak with someone else. One person mentioned that it was difficult to find on-line technical support.

When customers spoke with customer service representatives, they mostly found courteous, professional and knowledgeable staff. More customers ranked customer service representatives higher in terms of courteous and professional attitude than in terms of knowledge. Several customers said that the quality of customer service depends on the knowledge of the customer service representative who answers the call. A few customers relayed stories of poor customer service. For instance, one person called several times asking to be notified when the service was available in his area, but was never notified.

5.2.2.3 Customizing the @Home service

One half of the customers interviewed use the @Home home page. Some of those same customers use an alternate page as their home page. The other half of the customers uses their own home page, a work page, Yahoo! or Netscape. Most of the customers said it was fairly easy to change the @Home page to another default page. Only one customer said that he could not successfully change his default page because he did not receive adequate technical support.

Approximately one-half of customers interviewed have not tried to use another Internet Service Provider (ISP) with their @Home service. Reasons given to explain this choice included either the customer was not aware that this is possible or because it does not make financial sense. A few customers could not use another ISP because of compatibility issues with the @Home service. Customers that do use another ISP usually use America Online (AOL).

Two customers gave their general opinion of the @Home service, but did not complete the questionnaire. Both customers were extremely pleased with the service in terms of speed. One customer also noted that installation was not a problem.

6. Conclusion

6.1 Technical Evaluation

The TCI cable TV network upgrade is complete in the Green Lake build area. The areas tested have 70 TV channels with full-expanded programming within the 54 to 750 MHz frequency spectrum. The two headends on the fiber ring plus other redundancies built in to the network provide excellent survivability and reliability for the cable TV and @Home services. However, the reliability figures given in the maintenance record statistics indicate that the network quality is suffering as TCI services expand. An overall availability of 99.8574 percent, with 1121 minutes downtime for the audited areas, indicates a poor maintenance quality and unacceptable performance.

Downloading files on the @Home service proved faster than both traditional dial-up and DSL service. Upstream transmission is also faster using the @Home service.

TCI has activated 55,312 customers as of the end of September 1999 meeting the requirement under the franchise extension ordinance. The number of homes passed as of the end of September is 99,769.

6.2 Service Evaluation

TCI appears to be in compliance with the franchise extension ordinance in terms of expanded service offerings in the Green Lake build area, where customers have access to about 70 channels with their expanded basic cable TV service with TCI and also have high-speed Internet access through @Home.

Customer satisfaction of TCI cable TV service is ranked between average and high. The survey results from the interviews conducted in the Green Lake build area are similar to those conducted in the West Seattle build during Audit One. Although many customers gave TCI a high score in terms of current program content and variety, many also ranked the service as average and feel that it could be improved. Customers were more likely to express dissatisfaction with the video quality of the service mostly due to inconsistent or non-existent channel reception on one or more channels. Channel reception was a sore point because customers expect that, at a minimum, channels they pay for should be viewable.

Subscribers found customer service personnel to be courteous, professional and knowledgeable. The survey results indicate that customer service representatives answered service calls quickly. However, many "front line" representatives were not knowledgeable enough to solve problems on their own, so customers often had to wait to speak with a more knowledgeable representative.

Customers were satisfied with on-site installations and repairs in general. Green Lake customers did have to wait longer to schedule installations than West Seattle customers. Many waited over a week for the service to be installed.

The @Home service also received mixed reviews. It should be noted that this set of interviews captured customer experiences during the beginning of their relationship with @Home and before network construction was complete. During this phase customers spent a good portion of their customer experience establishing service, familiarizing themselves with the various service features, and in many cases making several calls to @Home for assistance. The survey results are reflective of this initiation period.

On the positive side, many customers were satisfied with the speed and functionality of the @Home service as well as with their installation and customer service experiences. Interviewees rated the installation experience highly in general. They also easily determined who to call for questions or service problems. Busy signals were rare. Customer service representatives were generally courteous, professional and fairly knowledgeable. Finally, customers found it easy to change the @Home page or to use another ISP over the @Home cable when they tried.

It is clear that this service is very impressive to customers who have no service issues. There were, however, a group of customers that had to contact customer service often in order to work out some problems. These customers spent from ten minutes to two hours on the phone waiting for a resolution to their problems. Customers attributed the time they spent waiting on the phone to too few knowledgeable customer service representatives. Most customers understood the complexity of the service issues, yet still expected a smoother time establishing service.

Several service outages occurred during the few months prior to the interviews, as network construction was being completed. Many customers recognized that these service outages caused access problems to the @Home service and to e-mail. Although outages prohibited access, it is difficult to tell whether all

access problems were caused solely by construction. Customers will be hopeful that there will be far fewer outages and access problems now that the network has been upgraded.

Finally, although customers in the Green Lake build area are largely pleased with the speed of the service, they question how speed will be affected when they have to share their cable bandwidth with additional subscribers.

6.3 Recommendations

TCI should examine their data collection and reporting methods to ensure that the information presented on the maintenance records is authentic. For example, the MTBF figure, 0.3 months or 21.84 hours as given in the maintenance records, is either incorrect or the network reliability is very poor. During this period at least one network outage occurred every twenty-two hours. A reliable network should stay operational for months without an outage.

TCI should clarify why they cannot measure the contention rate as specified in the original franchise agreement with the City of Seattle.

TCI should minimize service downtime to build better customer service levels. One way to minimize downtime or improve the failure rate is through proper maintenance of the network.

6.4 Audit Three

The third audit will assess the Queen Anne, Magnolia, Madison Park, Capitol Hill and South Seattle build area. Audit Three will provide a technical and service evaluation of TCI's network upgrade for the period of January 1999 through December 1999.

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8. Appendices

Appendix 1 - Maintenance records

Appendix 2 - Node capacity test results

Appendix 3 – Customer activation

Appendix 4 - Transmission test results

Appendix 5 - Service availability questionnaire

Appendix 6 – Summary of survey results